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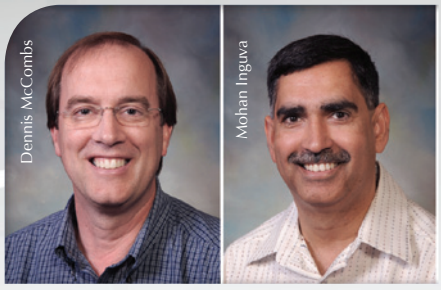


Open, Standardized, and Integrated Spatial Data Accelerates Operational Processes

By **Dennis McCombs**, IT Manager for Transmission and Distribution, and **Mohan Inguva**, Mapping Technology Supervisor, NV Energy

There's no doubt that the bright lights of Las Vegas make a powerful impression. The city is an exciting place, and that excitement is absolutely vital to the economy of Nevada. Behind the glitz, there's an energy company making sure that Las Vegas – and the rest of the state – gets the energy it needs to grow and thrive.

NV Energy provides electricity to 2.4 million residents throughout Nevada and parts of northeastern California. We also deliver electricity to meet the needs of the 40 million people who visit the state each year. With a service area of 54,500 square miles and 3,126 employees, NV Energy must operate efficiently to ensure that the people of Nevada get reliable service and good value. Our design and mapping technology helps NV Energy achieve that goal by supporting and improving operational processes.

How do design and mapping support operations? Decision makers can view real-time maps showing operational conditions. Customer service agents have fast access to outage information. Construction crews receive the materials they need to get the job done right the first time. And field crews can find and address issues more quickly. But these operational improvements didn't happen overnight. NV Energy had to overcome some challenges along the way.

Explosive Growth

In July 1999, Nevada Power, Sierra Pacific Power, and Sierra Pacific Resources merged to form one company, Sierra Pacific Resources. The company is now known as NV Energy, Inc. At the same time, the Las Vegas area and the state as a whole were growing rapidly. Approximately 40,000 new customers join the distribution network each year, and at the time, Sierra Pacific Resources was the fastest growing energy company listed on the New York Stock Exchange.

The company's internal processes and people were challenged to keep pace. In the design and mapping areas, our technology supported individual tasks, but not the rapid execution of entire processes. For example, in the design department, drafters used one application to design new connections, another to estimate costs, and generate a bill of materials (BOM). As a whole, the process was slow. It was common for drafters to over- and under-estimate materials, which resulted in returns or work crews having to retrieve additional materials to complete projects. Mapping processes suffered from a similar lack of integration, resulting in backlogs of new designs and as-builts.

Open, Standardized, and Integrated

In 1999 – the same year as the merger – the company's design, mapping, and information technology departments decided to adopt a bold approach to ensure that our technology better supported our processes. The approach was based on three simple concepts: open, standardized, and integrated. Our strategy for this bold approach was as follows:

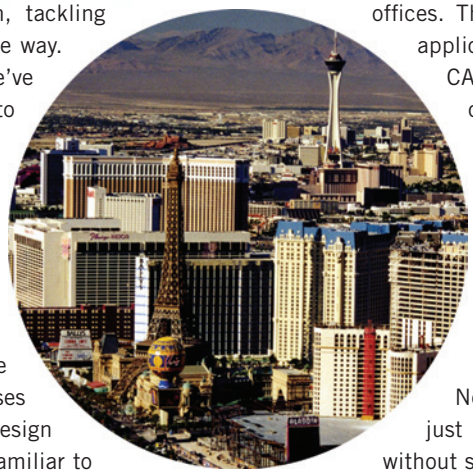
- **Open** – To create and store data, we decided to move to applications that rely on open data standards. Technologies that employ open standards are more flexible over the long term. We viewed our data as a core asset, and we didn't want to create and store data in proprietary formats, which limit what can be done with data, how data sharing occurs, and whether data can easily move to other systems.

- **Standardized** – From design to mapping to materials ordering, the company decided to refine and optimize standards for creating data and executing processes. Consistent processes are simply easier to improve and automate.

By adopting technology that could embed and enforce our standards, we saw an opportunity to reduce the risk of errors, train new employees faster, and move information between processes and department more seamlessly.

- **Integrated** – It was decided (as a long-term strategy) to move towards storing data in a central repository, giving us a single integrated, authoritative source for the information driving processes. Information that is stored in disparate systems cannot be easily shared and used across the enterprise in a timely manner. For instance, if customer service agents are unable to access location-based outage information through the tools available to them, they cannot answer customer questions about outages with precision. Instead, they're forced to rely on general updates from specialists with access to outage management systems.

Since 1999, NV Energy has implemented the open, standardized, and integrated approach, tackling and focusing on key processes along the way. The results are striking. At each step, we've successfully transformed our processes to save time, serve customers better, and operate with greater overall efficiency.



Starting with Design and Data Creation

NV Energy's technology and process improvement efforts began in the design department, where much of the data that drives operational processes originates. We decided to adopt a design application that used a CAD interface familiar to virtually any trained drafter and that allowed us to embed our own business rules and design standards within the design process. The application (from Autodesk), was a design productivity tool that automates the materials ordering process and integrates with the work management system.

Today, NV Energy's design process is no longer slowed by multiple applications. Instead, drafters begin new designs by selecting a job type and drafting the needed elements. Throughout the process, the application allows the drafter to reference standard "compatible units." Compatible units are simply NV Energy's standard groupings of materials. Using compatible units, drafters can easily choose the most cost-effective equipment for the job. In addition, NV Energy-specific rules help drafters perform and interpret calculations (e.g., voltage drops and sags), in order to select properly sized equipment. Because so much of the process is guided by NV Energy's business rules, we're able to train new drafters on our standards in a fraction of the time it previously took.

The most dramatic improvement to the design and data creation process involves bills of materials (BOMs). From within the same application used to create designs, drafters automatically generate and review BOMs that are based on precise measurements of all elements of the design and on NV Energy's business rules. For large jobs, we're saving several hours per BOM because drafters no longer use manual processes to create estimates. But the real savings are in the field. Crews get to job sites with the right amount of materials needed to complete work. That means they no longer have to stop work to retrieve missing materials, saving significant time and money.

Ending Mapping Backlogs

At about the same time that NV Energy enhanced the design process, we undertook a related project to reduce backlogs in the distribution network mapping department. Prior to this project, drafters were distributed among district offices. They were using a commonly used CAD application, but it was different from the CAD application used by other areas of the company. In addition, the drawing format was typically different from the format of the drawings sent in by developers. This required drawing conversions. Also, there was no common land base. This presented many problems such as drafters having to edge match design drawings. The process was time consuming. With the population of Nevada growing, backlogs were the norm, just as they are for those utilities in areas without significant growth.

NV Energy decided to centralize the mapping function and to standardize on just one CAD application for the enterprise. We also opted to store the data within an Oracle database that used open standards. Leveraging an existing investment in AutoCAD technology to edit data, the new distribution system mapping process allows data to move easily from design into the GIS.

Now, after designs are complete, GIS specialists import them into the GIS database, marking them as pending until they're built. Converting data between formats is no longer necessary. After construction, the specialists update the information with any new as-built and switching information and make the information live in the database. The new open, standardized, and integrated process is so much faster that NV Energy was able to drastically reduce the backlog of updates to the GIS within just a few months of implementation. So even when we added 40,000 new customers per year, the mapping department kept pace.

A Single Source of Spatial Data

NV Energy's process improvement efforts did not stop with transforming design and distribution mapping processes. The success of the open GIS database inspired us to explore the potential uses of spatial data throughout the organization. We realized that sharing online maps using the NV Energy intranet was an easy, low-cost way to disperse information company-wide.

When NV Energy first began using online maps in 2000, online mapping was quite new. The idea was to provide an easy-to-use interface that allowed people to query the database for location-based information, such as the nearest transformer or address to an outage, and get the information they needed on a dynamically generated map. We selected a map display tool based on open source technology to generate the browser-based maps, but the simple applications we developed in-house to process information requests were the real stars. They proved to be so easy to develop that we created dozens inspired by ideas from people throughout the organization.

NV Energy developed a number of applications for its web application – so many that they cannot all be described here – but the basic idea behind each is that employees without GIS or design application expertise gain access to spatial data. Customer service agents can view online maps and simple map-building applications that support their needs. For example, agents can see outage updates on maps linked to customer addresses, which helps them answer customer outage questions faster and with more detail.

Direct Database Queries Save Time

With spatial data being used to enhanced processes throughout NV Energy, we did not rest in our efforts. In fact, we noticed additional areas for improvement – and ways that our technology did not take us far enough. The database implemented around 2000 had some limitations. Specifically, it could not render spatial data queries within the database environment. Instead, another application, such as a spatial data design or creation tool, was needed to help process the query and the results. This limited the speed of queries and the types of queries that we could run. So NV Energy decided in 2005 to move to a spatially enabled version of Oracle database technology.

One formerly complex process provides a clear illustration of just how useful direct spatial queries can be. Wire mile tax calculations used to take a few weeks with a couple of drafters on the task fulltime, in part because tax districts in Nevada tend to be unusual shapes. We created a simple tool that makes it easy for accounting staff to conduct wire mile studies for tax calculations. The display interface is the same online mapping tool mentioned earlier, but all of the rendering is done within the database. Staffers simply select a tax district, and the application calculates and displays distribution assets the company needs to pay taxes on in that district.

Continually Improving Processes

While aligning our technology to better support operational process took hard work, the effort has paid measureable dividends in a number of areas. Drafters save several hours per design. We're reducing material handling and time with enhanced material estimating. NV Energy employees are serving customers more effectively and efficiently. Perhaps most importantly, our technology has the flexibility we need to continually refine our processes and meet new operational challenges into the future.

For instance, we are currently forging ahead with another ambitious project. NV Energy's open and spatially enabled database provided an environment well-suited to mapping and managing the assets within our transmission and fiber networks, which we had not formerly included in its GIS. Today, we are mapping the transmission and fiber networks within the spatial database, and at the same time, we are implementing an asset management system designed to integrate with the spatial database.

When complete, the new system will accelerate virtually every process related to mapping and maintaining the transmission network. The company will be able to directly import designs from the engineering firms that carry out most of projects on the transmission network. More significantly, we will be able to trace circuits remotely and plan maintenance activities more cost-effectively and proactively. When this project is complete, we'll find yet more ways to leverage open, integrated, and standardized technology to get more done in less time. ■

About the Authors

Dennis McCombs is the IT Manager, T&D, for NV Energy. He has worked for the company for over 15 years. He manages the teams that provide application development support for NV Energy's CAD, work management, GIS and web applications. Dennis holds a Bachelor of Science degree and a Master of Technology Management degree from Brigham Young University.

Mohan Inguva has been NV Energy's Supervisor for Mapping and Technology since May 2007. He is currently in charge of mapping NV Energy's north and south regions. His responsibilities include providing support to field crews and gathering requirements for mapping applications. Prior to his current role, Mohan was responsible for the implementation of Autodesk Utility Design and several applications for Autodesk MapGuide. He has been with NV Energy for 15 years and holds a Masters degree in Electrical and Computer Engineering from the University of Nevada, Las Vegas.